# Impact

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# The Impact of New Information Regime on Pricing Efficiency of Dual and Non Dual Listed Companies on the Jakarta and Surabaya Stock Exchanges

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**Abstract**

The existence of weak-form pricing efficiency on dual and non dual listed companies on the Jakarta and Surabaya stock exchanges for the period before and after regulation changes (from 1991 to 1995 for before and from 1996 to 2004 for after) using daily, weekly and monthly closing prices was investigated. This study provides evidence on the before and after impact of imposing new information regime on the Jakarta and Surabaya stock exchanges using weak-form efficiency test. This paper employs the BDS test, which is widely used to distinguish random independent and identically distributed error terms and also to detect non-linear dependence. Two variants of the BDS tests were performed to evaluate weak-form efficiency namely: (i) the normalized BDS test, (ii) the BDS test under EGARCH. The findings indicate that in general both the Jakarta and Surabaya stock exchanges show mixed evidence of weak form pricing efficiency. Before the regulation changes, both exchanges are weak-form efficient at the monthly interval but not for daily and weekly intervals. After regulation changes, both exchanges exhibit weak-form characteristics for monthly and weekly return series but not for daily interval. The results implied that the new information regime have impacted on the Jakarta and Surabaya stock exchange by making both exchanges becoming more price efficient.

**Keywords:** Weak-form EMH, Jakarta Stock Exchanges, Surabaya Stock Exchange, BDS Test, Information regime.
**JEL Classifications Codes:** G10, G14, and G18.

## 1. Introduction

Prior to 1st December 2007, there were two stock exchanges in Indonesia namely the Jakarta Stock Exchange (JSX) incepted in 1940 and with a market capitalization of 680 trillion rupiah as of December 2004; and the Surabaya Stock Exchange (SSX), first established on January 1925 and with a market capitalization of 605 trillion rupiah as of December 2004. More than 187 companies are listed both on the Jakarta Stock Exchange and the Surabaya Stock exchanges (dual listed companies) and 149 companies listed on the Jakarta Stock Exchange only (non dual listed companies). In 1996, the Indonesian government (i) introduces a new settlement procedure from T + 5 to T + 3, (ii) adopts a

new set of accounting standards from the Indonesian Accounting Standards to the International Accounting Standards and (iii) allows foreign investment to increase from 49% to 99%. The impact of these new announcements on pricing efficiency of dual and non dual companies listed on both JSX and SSX was investigated from EMH perspective.

There is ample evidence concerning the validity of the weak-form efficient market hypothesis (EMH) with respect to stock markets worldwide. The weak-form of the EMH postulates that successive one-period stock returns are independent and identically distributed (*iid*). This paper attempts to investigate the impact of new information regime on dual listed and non dual listed companies on the Jakarta Stock Exchange and the Surabaya Stock Exchange using the BDS weak-form efficiency test.

This paper used two different variants of Brock, Dechart and Scheinkman (BDS) models well-established as a powerful test of long run non-linear dependence; there are the normalized BDS test and the BDS test under EGARCH. This rest of the paper is organized as follows. Section 2 reviews documented evidence on weak form efficiency of the Indonesian market. The interested readers may refer to Annuar (2002) for a summary of evidence for and against market efficiency worldwide. Section 3 describes the data collection procedure and methodology. Section 4 discusses the findings and section 5 summarises the conclusion.

## 2. Review of Literature

Relatively few evidence were available evaluating the efficiency of the Indonesian stock market. Suad (1987) and Rusiti (1990) found that the market is fairly efficient in the weak sense. However, Suad (1990), Balsius (1993) and Agus (1995) found that the sufficient conditions for weak form efficiency were not satisfied.

Suad (1990) also investigated the semi-strong form efficiency using earnings, additional issues, and new issues announcements. The general findings indicate that market is not efficient in the semi-strong form sense. Further studies by Rusiti (1990), Muhammad (1993), Agus (1995), Mutamimah (1995), Untung, and Sidharta (1998) substantiated the findings of Fuad (1990). Endang (2000) found that share price response to bond announcements produces an average excess return significantly different from zero while Eka (2000) found that the average abnormal return is significantly positive at the pre-announcement date of mergers and acquisitions.

In summary all the evidence lead to the conclusion that the Indonesian stock market is generally inefficient.

## 3. Data and Methodology

The data were gathered from published materials available at the Jakarta Stock Exchange (JSX) and the Surabaya Stock Exchange (SSX). The periods of study cover the "before era" from 1991 to 1995 and the "after era" from 1996 to 2004.

### 3.1. The Data set

All data originate from the Jakarta Stock Exchange (JSX) and the Surabaya Stock Exchange (SSX); the data sets consist of daily, weekly, and monthly closing prices of dual and non dual listed companies before regulation changes from 1991 to 1995 and after regulation changes from 1996 to 2004. The closing prices of selected company's stocks traded anytime during August 1991 to December 2004 were extracted from both exchanges computers and daily dairies and financial information were obtained from the Companies' Annual Reports and the Stock Market Directory of both JSX and SSX. The information was cross-checked against the companies prospectuses filed with the Jakarta Stock Exchange. The final sets of data were divided into four categories. They were; (a) information on dual listed companies before regulation changes from 1991 to 1995, (b) information on dual listed

companies after regulation changes from 1996 to 2004, (c) information on non dual listed companies before regulation changes from 1991 to 1995 and (d) information on non dual listed companies after regulation changes from 1996 to 2004. The sampled companies were selected based on the following criteria; (i) companies must have 70% of traded prices recorded at the time, (ii) companies are of Indonesian domiciled, (iii) annual reports were publicly available, (iv) the companies have been listed for 5 years, (v) de listed, suspended and recently listed companies are excluded. For this study the number of samples based on the above criteria for dual and non dual listed comprise of 25 listed companies.

### 3.2. Methodology

#### 3.2.1. Normalized BDS Test

The BDS statistic as suggested by Brock et al. (1987) provides a powerful test of long-run nonlinear dependence within times series based correlation dimension. For the sake of expository convenience, following Chappell (1999), the notion and construction of the test statistic is described as follows. Let $X_t$: t = 1, 2,. $T$ denotes a sequence of scalar observations. Now form a sequence of (T-m+1) m dimensional vectors: $\{X_1^m, X_2^m, .. .., X_{T-m+1}^m\}$, where $X_r^m = [X_r, X_{r-1}, ..., X_{r-m-1}]$ and m is a positive integer such that $1 \leq m \leq T$. These vectors have been defined as m-histories. Let $C_{m,T}(\varepsilon)$ signifies the fraction of all m-histories in the sequence that are within a (Euclidian) distance of each other for some positive real number, $T_m = T - m + 1$. The quantity $C_{m,T}(\varepsilon)$ is defined as the correlation integral. Given these notions, the BDS statistic is constructed as:

$$W_{m,T}(\varepsilon) = \frac{\sqrt{T}[C_{m,T}(\varepsilon) - C_{1,T}(\varepsilon)^m]}{\sigma_{m,T}(\varepsilon)}, \quad (1)$$

where $W_{m,T}(\varepsilon)$ is the BDS statistic, and $\sigma_{m,T}(\varepsilon)$ is an estimate of the standard deviation of $[C_{m,T}(\varepsilon) - C_{m,T}(\varepsilon)^m]$. $T$ signifies the number of observations. The distribution of the $W_{m,T}(\varepsilon)$ statistic is asymptotically $N \sim (0, 1)$. Under the null hypothesis, the elements of the sequence of $X_t$ are independently and identically distributed (*iid*).

#### 3.2.2. The BDS Test under EGARCH

The standard GARCH models assume that positive and negative error terms have a symmetric effect on volatility. In the other words, good and bad news have the same effect on the volatility based on this model. In practice this assumption is frequently violated, in particular by stock returns, in that the volatility increases more after bad news than after good news. This so called Leverage Effect appears firstly in Black (1976), who noted that: "a drop in the value of the firm will cause a negative return on its stock, and will usually increase the leverage of the stock. That there are rise in the debt-equity ratio will surely mean a rise in the volatility of the stock".

There has been growing evidence in the finance literature that financial asset returns exhibit nonlinearity, time-varying heteroscedasticity, volatility cluster and non-normality. To account for these conditions, an exponential generalized autoregressive conditional heteroscedasticity in a mean (EGARCH-M) model as suggested by Nelson (1991) and tested the hypothesis of non linear independence in the standardized residuals using Brock, Dechart and Scheinkman (BDS) statistic proposed by Brock et al. (1987). The EGARCH-M model would capture the asymmetric impact of shocks on the volatility of stock returns and the BDS statistic applied on the standardized residuals would provide a formal test of *iid* (independently and identically distributed) assumptions. The EGARCH-M model to be fitted on the return series would be of the form:

$$\Delta \log P_t = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta \log p_{t-i} + \gamma \sigma_t + \varepsilon_t, \quad (2)$$

$$\varepsilon_t \left| \Omega \right| \sim (0,\ \sigma^2),$$

$$\log(\sigma^2) = \delta_0 + \delta_1 \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \delta_2 \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \Psi \sigma_{t-1}^2 \quad (3)$$

Equation (2) is the mean equation, which expresses stock return as a stable finite order autoregressive process augmented with a conditional standard deviation term. Equation (3) is the specification of the EGARCH model, which accounts for the asymmetric impact of shocks on the volatility of stock returns. The asymmetric impact is tested by hypothesizing that $\delta_2 \neq 0$, and the leverage effect is tested by the hypothesis that $\delta_2 < 0$.

## 4. The Findings

### 4.1. Descriptive Statistics

Table 1 (Panel A) presents the descriptive statistics for dual listed companies before regulation changes. The dual listed companies has mean daily return ranging from (0.25) % to 0% per share, mean weekly return from (1.18) % to 0.01% per share, and mean monthly return from (5.13) % to 0.09% per share. The standard deviations range from 0.0270 to 0.0762 for daily, from 0.0626 to 0.1670 for weekly and from 0.1198 to 0.3582 for monthly interval.

Panel B of Table 1 shows the stock returns on dual listed companies after regulation changes which have mean values ranging from (0.15) % to 0.03% per share for daily, from (0.70) % to 0.15% share for weekly, and from (3.06) % to 0.64 per share for monthly. The standard deviations range from 0.0384 to 0.0979 for daily, from 0.0481 to 0.2150 for weekly and from 0.1632 to 0.3573 for monthly returns.

Table 1 (Panel C) presents the mean return of non dual listed companies before regulation changes which ranges from (0.35) % to 0 % per share for daily, from (1.66) % to 0.15% per share for weekly, and from (7.28) % to 0.12% per share for monthly. The standard deviations range from 0.0199 to 0.0986 for daily, 0.0481 to 0.2150 for weekly, and from 0.1053 to 0.4492 for monthly.

Finally, Panel D of Table 1 shows the mean return of non dual listed individual after regulation changes which range from (0.13) % to 0.09% per share for daily, from (0.61) % to 0.41% per share for weekly, and from (2.89) % to 1.77% per share for monthly. The standard deviations range from 0.0141 to 0.0838 for daily, 0.0318 to 0.1681 for weekly, and from 0.0708 to 0.3701 for monthly.

**Table 1:** The Results of Descriptive Statistics

| Panel A: the Dual Listings Companies before Regulation Changes | | | |
|---|---|---|---|
| | **Daily** | **Weekly** | **Monthly** |
| Mean | -0.0025 to 0 | -0.0118 to 0.0001 | -0.0513 to 0.0006 |
| Median | 0 | 0 | -0.03661 to 0.0209 |
| Maximum | 0.1671 to 1.2528 | 0.2022 to 0.9904 | 0.2196 to 0.9904 |
| Minimum | -1.3863 to -0.3483 | -1.3863 to -0.2336 | -1.3863 to -0.3392 |
| Std. Dev. | 0.0270 to 0.0762 | 0.0626 to 0.1670 | 0.1198 to 0.3582 |
| **Panel B: the Dual Listings Companies after Regulation Changes** | | | |
| Mean | -0.0015 to 0.0003 | -0.0070 to 0.0015 | -0.0306 to 0.0064 |
| Median | 0 | 0 | -0.0247 to 0 |
| Maximum | 0.2151 to 2.9957 | 0.3327 to 2.8622 | 0.4212 to 2.8258 |
| Minimum | -1.6301 to -0.2412 | -1.7284 to -0.3857 | -1.9694 to -0.4855 |
| Std. Dev. | 0.0384 to 0.0979 | 0.0792 to 0.1896 | 0.1632 to 0.3573 |
| **Panel C: the Non Dual Listings Companies before Regulation Changes** | | | |
| Mean | -0.0035 to 0 | -0.0166 to 0.0015 | -0.0728 to 0.0012 |
| Median | 0 | 0 | -0.0279 to 0 |
| Maximum | 0 to 1.6094 | 0 to 1.6094 | 0 to 1.6094 |
| Minimum | -1.8192 to -0.2549 | -1.8192 to -0.3155 | -1.8192 to -0.3151 |
| Std. Dev. | 0.0199 to 0.0986 | 0.0481 to 0.2150 | 0.1053 to 0.4492 |
| **Panel D: the Non Dual Listings Companies after Regulation Changes** | | | |
| Mean | -0.0013 to 0.0009 | -0.0061 to 0.0041 | -0.0289 to 0.0177 |
| Median | 0 | 0 | -0.0247 to 0 |
| Maximum | 0.2364 to 1.8326 | 0.2513 to 2.0369 | 0.3054 to 2.0949 |
| Minimum | -2.4365 to -0.3015 | -2.4617 to -0.2007 | -2.4849 to -0.2877 |
| Std. Dev. | 0.0141 to 0.0838 | 0.0318 to 0.1681 | 0.0708 to 0.3701 |

The general observation from the descriptive statistics shows that consistent with the risk-return trade-off, monthly return is higher than weekly and daily returns, the risk of monthly return is also higher that daily and weekly returns.

### 4.2. Weak-Form Efficiency Test Results

The weak form pricing efficiency test results based upon the two variants of the BDS test were tabulated in Table 2 (normalized BDS for dual listed companies before and after regulation changes), Table 3 (normalised BDS for non dual listed companies before and after regulation changes), Table 4 (BDS with EGARCH for dual listed companies before and after regulation changes), and Table 5 (BDS with EGARCH for non dual listed companies before and after regulation changes).

#### 4.2.1. Normalised BDS Test Results

**(i) Results on Dual Listed Companies before and after Regulation Changes**

The normalized BDS tests results for stock returns series on dual listed companies before and after regulation changes were reported in Table 2. The findings support, in general, the random walk hypothesis and the market is in weak-form efficient for all return series, except for daily and weekly intervals for before regulation changes and for daily returns after regulation changes.

**Table 2:** The number of Companies which accepted the Null Hypothesis using Normalized BDS Test on Dual Listed Companies before and after Regulation Changes

| Dual Listed Companies N = 25 | | | | |
|---|---|---|---|---|
| | **Before Regulation Change** | | **After Regulation Change** | |
| **Accepted $H_0$: RW** | **Quantity** | **%** | **Quantity** | **%** |
| Daily | 6 | 24 | 6 | 24 |
| Weekly | 11 | 44 | 16 | 64 |
| Monthly | 18 | 72 | 21 | 84 |

There were 6 companies (24%) for daily, 11 companies (44%) for weekly and 18 companies (72%) for monthly returns where the price series follow a random walk of *iid*. These results points to the evidence that majority of dual listed companies do not follow of the random walk hypothesis and the market is not weak-form efficient for all series except for monthly returns. Table 2 also presents the number of dual listed companies after regulation changes where the price series following random walk cannot be rejected. The same 6 companies (24%) for daily, 16 (an extra 5) companies (64%) for weekly and 21 (an extra 3) companies (84%) for monthly returns show price behaviour in accordance to random walk. The findings show that there is a strong tendency for price behaviour of dual listed companies to follow random walk with the imposition of a new information regime.

**(ii) Results on Non Dual Listed Companies before and after Regulation Changes**

Table 3 shows the number of non dual listed companies before regulation changes where the null hypothesis of *weak form efficiency* and insignificant at the 5% level cannot be rejected; there were 4 companies (16%) for daily, 8 companies (32%) for weekly and 17 companies (68%) for monthly returns. These results indicate that majority of dual listed companies do not follow the random walk hypothesis and the market is not the weak-form efficient for all series except for monthly returns.

Table 3 also shows the number of non dual listed companies after regulation changes where the null hypothesis of *iid* and insignificant at the 5% level cannot be rejected; there are 5 companies (20%) for daily, 15 companies (60%) for weekly and 19 companies (76%) for monthly returns. These results indicate that majority of non dual companies follow the random walk hypothesis and the market is weak-form efficiency for all series except for daily returns.

**Table 3:** Number of companies which accepted the Null Hypothesis using Normalized BDS Test on Non Dual Listed Companies before and after Regulation Changes

| Non Dual Listed Companies N = 25 | | | | |
|---|---|---|---|---|
| | Before Regulation Changes | | After Regulation Changes | |
| Accepted $H_0$: RW | Quantity | % | Quantity | % |
| Daily | 4 | 16 | 5 | 20 |
| Weekly | 8 | 32 | 15 | 60 |
| Monthly | 17 | 68 | 19 | 76 |

### 4.2.2. BDS with EGARCH Test Results

**(i) The Results on Dual Listed Companies before and after Regulation Changes**

The results relating to the BDS test under EGARCH model on dual listed companies before and after regulation changes were recorded in Table 4. The results show that before regulation changes, the null hypothesis of *iid* and insignificant at the 5% level are rejected for all return series except for monthly returns.

**Table 4:** The number of Companies which accepted the Null Hypothesis of *iid* for the BDS Test under EGARCH

| Dual Listed Companies N = 25 | | | | |
|---|---|---|---|---|
| | Before Regulation Changes | | After Regulation Changes | |
| Accepted $H_0$: RW | Quantity | % | Quantity | % |
| Daily | 7 | 28 | 8 | 32 |
| Weekly | 11 | 44 | 15 | 60 |
| Monthly | 18 | 72 | 22 | 88 |

There were 7 companies (28%) for daily returns, 11 companies (44%) for weekly returns and 18 companies (72%) for monthly returns. Table 4 also shows the results after regulation changes that the null hypothesis of *iid* and insignificant at 5% level cannot be rejected for weekly and monthly

returns intervals; there were 8 companies (32%) for daily returns, 15 companies (60%) for weekly returns and 22 companies (88%) for monthly returns respectively. The results indicate that the pricing behaviour dual listed companies tend to be more efficient after the introduction of a new set of regulations.

**Table 5:** The number of Companies which accepted the Null Hypothesis of *iid* for the BDS Test under EGARCH

| Non Dual Listed Companies N = 25 | | | | |
|---|---|---|---|---|
| | Before Regulation Changes | | After Regulation Changes | |
| Accepted $H_0$: RW | Quantity | % | Quantity | % |
| Daily | 4 | 16 | 5 | 20 |
| Weekly | 6 | 24 | 14 | 56 |
| Monthly | 18 | 72 | 19 | 76 |

Table 5 presents the number of non dual listed companies before and after regulation changes that the null hypothesis *iid* and insignificant at 5% level cannot be rejected based on BDS with EGARCH method; there were 4 companies (16%) for daily returns, 6 companies (24%) for weekly returns and 18 companies (72%) for monthly returns. Table 5 also shows the results of non dual listed companies after regulation changes that the null hypothesis of *iid* and insignificant at 5% level are accepted; there were 5 companies (20%) for daily returns, 14 companies (56%) for weekly returns and 19 companies (76%) for monthly returns respectively.

These results indicate that majority of non dual listed companies before regulation changes do not follow the random walk and the market is not weak-form efficiency for all series except for monthly returns. However, these results indicate that the majority of non dual listed companies after regulation changes follow the random walk hypotheses for all series except for daily returns.

## 5. Conclusion

This section presents the conclusions and implications of the study. The main objective of this study is to investigate the pricing efficiency of both the Jakarta and Surabaya stock exchanges before and after the imposition a new set of regulations. The period of study spans over four years period from 1991 to 1995 for dual and non dual listed companies before regulation changes and nine years period from 1996 to 2004 for dual and non dual listed companies after regulation changes.

Two different procedures are employed to test the weak-from efficient stock market for daily, weekly and monthly returns. They are (i) the normalized BDS test and (ii) the BDS test under EGARCH.

The findings on the pricing efficiency based on the two methods suggest the price behaviour of dual and non dual listed companies before regulation changes from 1991 to 1995 rejected the random walk hypothesis for all of the returns series but the market shows weak-from efficiency for monthly returns. However, the results on dual and non dual listed companies after regulation changes from 1996 to 2004 cannot reject the random walk hypothesis for all the returns series, except for daily returns and the market shows weak-form pricing efficiency for weekly and monthly returns. The results imply that the new information regime has impacted both JSX and SSX by making both exchanges becoming more price-efficient.

The findings of this study have a number of implications. For, the researchers, the study has shown that given an information regime that promotes transparency and openness, the behaviour of the Indonesian stock market as an emerging stock market reflects the general behaviour of weak form efficiency of many developing and developed stock markets worldwide.

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